

CLAIMS

1. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier defining a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race adapted to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race; and

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said aligning ring adapted for engagement with the spring plate of the clutch assembly;

said front face of said aligning ring defining a plane that is normal to the axis of said bearing carrier, said aligning ring and said bearing being adapted to allow limited angular displacement of said front face away from normal relative to said central axis of said bearing carrier.

2. The clutch release bearing assembly of claim 1 wherein said bearing assembly has an inner diameter and said bearing carrier has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

3. The clutch release bearing assembly of claim 1 wherein said aligning ring is mounted to said bearing assembly and adapted to allow limited radial displacement of said aligning ring relative to said central axis of said bearing carrier.

4. The clutch release bearing assembly of claim 3 further including a support hub mounted to said rotatable race, wherein said aligning ring includes a central bore adapted to be supported on said support hub, said aligning ring having an inner diameter and said bearing carrier having an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said aligning ring and said support hub to allow limited radial shifting of said aligning ring with respect to said central axis of said bearing carrier.

5. The clutch release bearing assembly of claim 1 including an elastomeric device disposed between said aligning ring and said bearing carrier to support said aligning ring and to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

6. The clutch release bearing assembly of claim 5 wherein said elastomeric device is a solid o-ring disposed between said aligning ring and said rotatable race.

7. The clutch release bearing assembly of claim 6 wherein said o-ring is made from Nitrile.

8. The clutch release bearing assembly of claim 1 wherein said bearing carrier includes a first end and a second end, a first snap ring groove extending radially about said outer diameter adjacent said first end, a first snap ring disposed within said first snap ring groove, a washer attached to said second end and a support sleeve extending over said bearing carrier adjacent said washer, wherein

said stationary race is disposed between said support sleeve and said first snap ring and thereby held in a fixed axial position.

9. The clutch release bearing assembly of claim 8 wherein said first snap ring is a spring washer having a plurality of layers of a helically wound serpentine strip of resilient material.

10. The clutch release bearing assembly of claim 1 including a hydraulic chamber having a fluid disposed therein located between said aligning ring and said bearing carrier to support said aligning ring and to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing.

11. The clutch release bearing assembly of claim 10 wherein said hydraulic chamber comprises a pair of o-rings disposed between said aligning ring and said rotatable race at a distance from each other, thereby forming a cavity defined by an interior surface of said aligning ring, an outer surface of said support ring and said pair of o-rings; and a fluid disposed within said cavity.

12. The clutch release bearing assembly of claim 11 wherein said aligning ring includes a plurality of orifices extending therethrough to allow access to said cavity to inject or remove said fluid, each of said orifices further including a plug to seal said orifices.

13. The clutch release bearing assembly of claim 10 wherein said hydraulic chamber is a fluid filled bladder disposed between said aligning ring and said rotatable race.

14. The clutch release bearing assembly of claim 1 wherein said rotatable race has a spherical face and said aligning ring has a spherical face, said spherical face of said rotatable race engaging said spherical face of said aligning ring to allow

limited angular displacement of the front face away from normal relative to the axis of said bearing.

15. The clutch release bearing assembly of claim 14 wherein said rotatable race includes an oil groove extending radially about said rotatable race to retain a lubricant that reduces the friction between said rotatable race and said aligning ring.

16. The clutch release bearing assembly of claim 14 wherein said rotatable race includes a groove extending radially about said rotatable race adapted to receive an o-ring.

17. The clutch release bearing assembly of claim 14 including a plurality of anti-friction elements disposed between said rotatable race and said aligning ring.

18. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race;

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

said front face of said aligning ring defining a plane that is normal to said central axis of said bearing carrier, said assembly including an elastomeric device

disposed between said aligning ring and said bearing carrier to support said aligning ring and to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

19. The clutch release bearing assembly of claim 18 wherein said bearing assembly has an inner diameter and said bearing carrier has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

20. The clutch release bearing assembly of claim 18 wherein said elastomeric device is a solid o-ring disposed between said aligning ring and said rotatable race.

21. The clutch release bearing assembly of claim 20 wherein said o-ring is made from Nitrile.

22. The clutch release bearing assembly of claim 18 wherein said bearing carrier includes a first end and a second end, a first snap ring groove extending radially about said outer diameter adjacent said first end, a first snap ring disposed within said first snap ring groove, a washer attached to said second end and a support sleeve extending over said bearing carrier adjacent said washer, wherein said stationary race is disposed between said support sleeve and said first snap ring and thereby held in a fixed axial position.

23. The clutch release bearing assembly of claim 22 wherein said first snap ring is a spring washer having a plurality of layers of a helically wound serpentine strip of resilient material.

24. The clutch release bearing assembly of claim 18 wherein said aligning ring is mounted to said bearing assembly to allow limited radial displacement of said aligning ring relative to said central axis of said bearing carrier.

25. The clutch release bearing assembly of claim 19 further including a support hub mounted to said rotatable race, wherein said aligning ring includes a central bore adapted to be supported on said support hub, said aligning ring having an inner diameter and said bearing carrier having an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said aligning ring and said support hub to allow limited radial shifting of said aligning ring with respect to said central axis of said bearing carrier.

26. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race; and

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

said front face of said aligning ring defining a plane that is normal to said central axis of said bearing carrier, said assembly including a pair of o-rings

disposed between said aligning ring and said rotatable race at a distance from each other, thereby forming a hydraulic chamber defined by an interior surface of said aligning ring, an outer surface of said support ring and said pair of o-rings, and a fluid disposed within said hydraulic chamber to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

27. The clutch release bearing assembly of claim 26 wherein said bearing assembly has an inner diameter and said bearing carrier has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

28. The clutch release bearing assembly of claim 26 wherein said aligning ring includes a plurality of orifices extending therethrough to allow access to said hydraulic chamber to inject or remove said fluid, each of said orifices further including a plug to seal said orifices.

29. The clutch release bearing assembly of claim 26 wherein said bearing carrier includes a first end and a second end, a first snap ring groove extending radially about said outer diameter adjacent said first end, a first snap ring disposed within said first snap ring groove, a washer attached to said second end and a support sleeve extending over said bearing carrier adjacent said washer, wherein said stationary race is disposed between said support sleeve and said first snap ring and thereby held in a fixed axial position.

30. The clutch release bearing assembly of claim 29 wherein said first snap ring is a spring washer having a plurality of layers of a helically wound serpentine strip of resilient material.

31. The clutch release bearing assembly of claim 26 wherein said aligning ring is mounted to said bearing assembly to allow limited radial displacement of said aligning ring relative to said central axis of said bearing carrier.

32. The clutch release bearing assembly of claim 31 further including a support hub mounted to said rotatable race, wherein said aligning ring includes a central bore adapted to be supported on said support hub, said aligning ring having an inner diameter and said bearing carrier having an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said aligning ring and said support hub to allow limited radial shifting of said aligning ring with respect to said central axis of said bearing carrier.

33. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race; and

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

said front face of said aligning ring defining a plane that is normal to said central axis of said bearing carrier, said assembly including a fluid filled bladder disposed between said aligning ring and said rotatable race to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

34. The clutch release bearing assembly of claim 33 wherein said bearing assembly has an inner diameter and said bearing carrier has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

35. The clutch release bearing assembly of claim 33 wherein said bearing carrier includes a first end and a second end, a first snap ring groove extending radially about said outer diameter adjacent said first end, a first snap ring disposed within said first snap ring groove, a washer attached to said second end and a support sleeve extending over said bearing carrier adjacent said washer, wherein said stationary race is disposed between said support sleeve and said first snap ring and thereby held in a fixed axial position.

36. The clutch release bearing assembly of claim 35 wherein said first snap ring is a spring washer having a plurality of layers of a helically wound serpentine strip of resilient material.

37. The clutch release bearing assembly of claim 33 wherein said aligning ring is mounted to said bearing assembly to allow limited radial displacement of said aligning ring relative to said central axis of said bearing carrier.

38. The clutch release bearing assembly of claim 37 further including a support hub mounted to said rotatable race, wherein said aligning ring includes a central bore adapted to be supported on said support hub, said aligning ring having an inner diameter and said bearing carrier having an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said aligning ring and said support hub to allow limited radial shifting of said aligning ring with respect to said central axis of said bearing carrier.

39. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race;

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

said bearing assembly having an inner diameter and said bearing carrier having an outer diameter, said inner diameter and said outer diameter being sized

such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said bearing carrier;

said front face of said aligning ring defining a plane that is normal to said central axis of said bearing carrier, said rotatable race having a spherical face and said aligning ring having a spherical face, said spherical face of said rotatable race engaging said spherical face of said aligning ring to allow limited angular displacement of the front face away from normal relative to said central axis of said bearing carrier.

40. The clutch release bearing assembly of claim 39 wherein said bearing assembly has an inner diameter and said bearing carrier has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said bearing carrier to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

41. The clutch release bearing assembly of claim 39 wherein said rotatable race includes a groove extending radially about said rotatable race to retain a lubricant that reduces the friction between said rotatable race and said aligning ring.

42. The clutch release bearing assembly of claim 39 wherein said rotatable race includes a groove extending radially about said rotatable race adapted to receive an o-ring.

43. The clutch release bearing assembly of claim 39 wherein said bearing carrier includes a first end and a second end, a first snap ring groove extending radially about said outer diameter adjacent said first end, a first snap ring disposed within said first snap ring groove, a washer attached to said second end and a

support sleeve extending over said bearing carrier adjacent said washer, wherein said stationary race is disposed between said support sleeve and said first snap ring and thereby held in a fixed axial position.

44. The clutch release bearing assembly of claim 43 wherein said first snap ring is a spring washer having a plurality of layers of a helically wound serpentine strip of resilient material.

45. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race;

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said front face of said aligning ring defining a plane that is normal to said central axis of said bearing carrier, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

a plastic piston disposed between said bearing and said bearing carrier and supporting said bearing, said bearing carrier including an annular channel, and said plastic piston including an annular ridge disposed within said annular channel; and

a ring of elastomeric material disposed within said annular channel between said plastic piston and said bearing carrier for supporting said plastic piston and to

allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

46. The clutch release bearing assembly of claim 45 wherein said bearing assembly has an inner diameter and said plastic piston has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said plastic piston to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

47. The clutch release bearing assembly of claim 45 wherein said annular ridge of said piston is operatively connected to said ring of elastomeric material to prevent said annular ridge from moving radially with respect to said ring of elastomeric material, thereby maintaining radial positioning of said annular ridge within said annular channel.

48. A clutch release bearing assembly adapted to engage a spring plate of a clutch assembly of a motor vehicle manual transmission to either push or pull the spring plate to release the clutch of the manual transmission, said clutch release assembly comprising:

a bearing carrier with a central axis;

a bearing assembly supported on said bearing carrier, said bearing assembly including a stationary race, a rotatable race and a plurality of anti-friction elements disposed between said stationary race and said rotatable race to support said rotatable race and to allow rotational movement of said rotatable race with respect to said stationary race;

an aligning ring including a radial outer diameter and a front face mounted to said rotatable race, said front face of said aligning ring defining a plane that is normal

to said central axis of said bearing carrier, said aligning ring adapted for engagement with a spring plate of a clutch assembly;

a plastic piston disposed between said bearing and said bearing carrier and supporting said bearing, said bearing carrier including an annular channel, and said plastic piston including an annular ridge disposed within said annular channel; and

a seal mounted onto said annular ridge and engaging inner walls of said annular channel to form a cavity, and a fluid being disposed within said cavity to support said plastic piston and to allow limited angular displacement of said front face of said aligning ring away from normal relative to said central axis of said bearing carrier.

49. The clutch release bearing assembly of claim 48 wherein said bearing assembly has an inner diameter and said plastic piston has an outer diameter, said inner diameter and said outer diameter being sized such that there is a clearance fit between said bearing assembly and said plastic piston to allow limited radial shifting of said bearing assembly with respect to said central axis of said bearing carrier.

50. The clutch release bearing assembly of claim 48 wherein said annular ridge of said piston is operatively connected to said seal to prevent said annular ridge from moving radially with respect to said seal, thereby maintaining radial positioning of said annular ridge within said annular channel.